# APPENDIX I

# TEXAS WATER COMMISSION

***ACTION PLAN DEMONSTRATION PROJECT PROPOSAL FOR GALVESTON BAY/HOUSTON SHIP CHANNEL SYSTEM***

***POLLUTION PREVENTION TO PROTECT PUBLIC HEALTH: REDUCTION OF CHEMICAL CONTAMINANTS TO THE GALVESTON BAY ESTUARY THROUGH INDUSTRIAL FACILITY AUDITS AND PLANNING***

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## SUMMARY

The Texas Water Commission (TWC) submits this document as a proposed National Estuary Program Action Plan Demonstration Project for FY91 funding. The proposed action plan is based on applying our demonstrated pollution prevention capabilities to the pollution problems facing the Galveston Bay. Specifically, in cooperation with select Galveston Bay businesses, TWC proposes to perform Industrial Waste Audit training, to work closely with businesses to reduce pollution, develop planning for waste recovery methodologies and encourage participation in waste exchange programs for hazardous waste generators and toxic material users who discharge directly and indirectly into Galveston Bay. TWC will select businesses based on the assessment of the risks facing Galveston Bay and the industrial processes creating the risks.

The Texas Water Commission is uniquely qualified to undertake the proposed project. Two groups within the Commission will be used in order to focus the efforts on this project; the Hazardous and Solid Waste Division's Waste Minimization Unit and the Water Quality Division.

The Commission's Waste Minimization Unit was created to develop and promote pollution prevention through out Texas. This Unit has developed and implemented the states highly successful Resource Exchange Network for Eliminating Waste (RENEW), and a state Recycling Directory. In addition, members of the Unit perform Waste Audits and conduct hazardous waste minimization training.

Coupled with the Waste Minimization Unit will be the Commission's Water Quality Division which is responsible for the state's efforts to prevent, control and abate water pollution in Texas. Designated by the Governor as the State water quality planning agency, the Texas Water Commission coordinates all water quality planning in the State to meet requirements set out in the Texas Water Code and the Federal Clean Water Act. This is achieved in cooperation with the appropriate local planning agencies, the U.S. Environmental Protection Agency (EPA), other state agencies and river authorities.

Together the Waste Minimization Unit and the Water Quality Division will provide for the timely and cost effective execution of the proposed project.

This proposal is presented in the format suggested by the EPA in its "Action Plan Demonstration Project Proposal Checklist", and specifically addresses the ten items required by the EPA. In summary the proposal is based on accomplishing five objectives. These objectives are listed below. Major emphasis (time and dollars) will be placed on objective (4) "Conduct Training" and objective (5) "Follow-up".

1. Define pollutants: - Based on analyses of risks, define the pollutants of concern in the Houston Ship Channel.

2. Define businesses: - Based on a review of TWC Hazardous Waste Generation data, define the businesses located near the channel most likely generating the pollutants found in the channel.

3. Select businesses: - Select and contact 5 to 10 businesses and make arrangements for them to voluntarily participate in a program focusing on the use of waste audits, waste recovery methodologies, and waste exchange programs.

4. Conduct training: - Conduct waste minimization training for the selected businesses, either as a group or at individual sites.

5. Follow-up: Follow-up with businesses in order to evaluate the success of the program and to provide technical assistance.

The objectives will be accomplished with 1.25 man years of professional time; 0.1 man years of supervisory time; and 0.1 man years of secretarial time. It is proposed that the estimated cost of $133,000 be split, with $33,333 (25%) being paid by the State of Texas and $100,000 (75%) being paid by federal sources.

## 1. DISCUSSION OF THE PROBLEM, IDENTIFYING THE PROBABLE CAUSES AND SOURCES.

The Houston Ship Channel is part of the San Jacinto River Basin and is located in southeast Texas adjacent to the City of Houston and Galveston Bay. The 1,155 square mile (2,992 square kilometer) watershed encompasses most of Harris County and parts of Fort Bend and Waller counties. The Houston Ship Channel is a dredged channel created along portions of Buffalo Bayou and the San Jacinto River.

The City of Houston encompasses most of the Houston Ship Channel watershed. However, many other smaller towns and suburbs including Pasadena, Deer Park, Baytown, Galena, Jacinto City, South Houston, West University Place, Bellaire and Katy, lie within the watershed.

With nearly 50 percent of the total United States' chemical production, the Houston area is the major center of chemical production in the United States. In addition, 30 percent of the U.S. petroleum industry is located in the area adjacent to Galveston Bay. When this heavy industry is coupled with the more than seven million people that use Galveston Bay as a final destination for their wastewater, it is not surprising to learn that nearly 50 percent of wastewater discharges in the State are in the Galveston Bay watershed. The Houston Ship Channel alone contains nearly 550 permitted discharges or 13.4 percent of the State total.

The large number of discharges in this area creates a tremendous potential for toxic substance contamination of the Houston Ship Channel and Galveston Bay. A recent study by EPA-Region 6, in conjunction with the TWC, investigated the water quality and ambient toxicity of the Houston Ship Channel/San Jacinto River. Chemical-specific criteria exceedances were found for arsenic, copper, cyanide, lead and nickel. The study indicates that detectable amounts of toxicants at different monitoring stations are due to point source influence. An additional series of samples was collected from the Houston Ship Channel and Galveston Bay as part of the study. Chemical-specific criteria exceedances were found for nickel and copper in portions of Galveston Bay. The data indicated that a possible source of copper and nickel is the Texas City Ship Channel.

The Texas Department of Health analyzed additional data and issued a fish consumption advisory for the Houston Ship Channel and Upper Galveston Bay. These analyses were conducted in response to studies showing an exceedance of EPA's fish tissue level of concern for dioxin. Bleached kraft pulp and paper mill dischargers in the area are possible point sources of dioxin.

Past and ongoing efforts to improve the water quality of the Houston Ship Channel made by the Texas Water Commission have included;

1. More stringent wastewater permit requirements;
2. Expanded self-reporting requirements;
3. Intensive surveys;
4. Sediment studies;
5. Reaeration studies;
6. Water Quality evaluations;
7. Change in Segment Boundaries and Standards Criteria;
8. Addition of new segments;
9. Nonpoint source studies;

10. Instream aeration studies;
11. Stream monitoring;
12. Use attainability analysis.

As can be seen from this list, our past efforts have focused on collecting much needed water quality data and on regulatory and permitting activities. Much of the pollution entering the Houston Ship Channel is thought to come from industrial businesses near the channel; therefore, the effort proposed in this plan focuses on decreasing the amount of pollution entering the Houston Ship Channel by educating, and working closely with the industrial dischargers in the use of industrial waste audits, waste recovery methodologies, and waste exchange programs.

## 2. STATEMENT OF SPECIFIC OBJECTIVES RELATED TO THE PROBLEM, SOURCE, OR CAUSE.

The Texas Water Commission's approach to the problem will be based on accomplishing five objectives. These specific objectives are:

1. Define pollutants: - Based on analyses of risks, define the pollutants of concern in the Houston Ship Channel.

2. Define Businesses: - Based on a review of Texas Water Commission Hazardous Waste Generation data, define the businesses located near the channel most likely generating the pollutants found in the channel.

3. Select businesses: - Select and contact 5 to 10 businesses and make arrangements for them to voluntarily participate in a program focusing on the use of waste audits, waste recovery methodologies, and waste exchange programs.

4. Conduct training: - Conduct waste minimization training for the selected businesses, either as a group or at individual sites.

5. Follow-up: - Follow-up with businesses in order to evaluate the success of the program and to provide technical assistance.

## 3. DISCUSSION OF THE VARIOUS MANAGEMENT OPTIONS CONSIDERED.

As discussed in "1. DISCUSSION OF THE PROBLEM, IDENTIFYING THE PROBLEM CAUSES AND SOURCES", the Texas Water Commission has employed various management options to the problem of pollution in the Houston Ship Channel. TWC has worked with Federal and local agencies in addressing this problem in both enforcement and remedial contexts. The current proposal focuses on a capability that did not exist within the Texas Water Commission until last year. That capability is Hazardous Waste Minimization training. Waste minimization makes sense and its use in pollution prevention can be significant; therefore, TWC would like the opportunity to employ its use to the problems facing the Houston Ship Channel.

An outline of a one day hazardous waste minimization course is included in Appendix A.

## 4. DISCUSSION OF THE CHOSEN OPTION WITH REFERENCE TO THE LIKELIHOOD OF SUCCESS, PUBLIC SUPPORT, AND TIME AND RESOURCES.

Industrial waste audits, waste recovery programs and exchanges and waste minimization programs have proven to be effective options in decreasing the amounts of pollutants entering the environment. In light of this fact both the Federal government and the State of Texas have made waste minimization their number one waste management methodology for dealing with pollutants.

In the State of Texas, two bills are currently in front of the state legislature that deal with pollution prevention. Both bills require businesses located within the state to develop waste minimization plans and annual waste minimization reports. In light of these bills, it is apparent that the proposed project is timely, and that the likelihood of public (and industry) support would be high. This factor when coupled with the Texas Water Commission's past involvement with the Houston Ship Channel and TWC's past Waste Minimization efforts in the State of Texas makes the probability of the proposed project's success high.

Examples of TWC's past Waste Minimization efforts include:

1) Development of the Resource Exchange Network for Eliminating Waste (RENEW). RENEW is an information clearinghouse established, at the direction of the 70th Texas Legislature, to promote the reuse and reclamation of waste materials. The exchange provides an opportunity to sell surplus materials, by-products and waste. During Fiscal Year 1990 RENEW received 78 new listings. Of these, 60 were for materials available while 10 were for materials wanted. During the same period, RENEW received 901 inquiries for the materials listed, up 100% from 1989, RENEW confirmed 14 successful exchanges in FY 1990, with many inquiries still under negotiation.

2) Publication of the "State of Texas Industrial Materials Recycling Directory", which lists companies who recycle industrial solid waste, including hazardous and non-hazardous waste in Texas. An updated version is due out in 1991.

3) Development of waste minimization training. Presentations have been made at various events throughout the state including the "Wastewater Pretreatment Seminar" (San Antonio, November 14, 1990); the Texas Chemical Council's "Hazardous Waste Workshop" (Austin, December 1990); and the Texas Water Commission's "Hazardous Waste Trade Fair and Conference" (Dallas, March 1991).

4) A "Waste Minimization Self-Assessment Manual" which is scheduled to be published in 1991.

**5. A COMPLETE OUTLINE OF THE SPECIFIC PLAN NEEDED TO ABATE AND CONTROL THE PROBLEM OR PROTECT THE RESOURCE. EACH OUTLINE SHOULD ADDRESS: WHO, WHAT, WHERE, WHEN, HOW.**

WHO:

Texas Water Commission
Water Quality Division
Hazardous and Solid Waste Division
Waste Minimization Unit
Contact: Dr. Priscilla Seymour
(512) 463-7761

The Texas Water Commission will be in charge of the entire project and conduct the work with in-house staff. The Project leader will be Dr. Priscilla Seymour, Unit Head off the Waste Minimization Unit. She will be supported in her efforts by her staff and by personnel of the Water Quality Division.

WHAT:

Section 2 "Statement of Specific Objectives Related to the Problem, Source, or Cause", the objectives of this proposed program. By attaining these objectives we will also attain the environmental objective of reducing the pollution loading in the Galveston Bay and Houston Ship Channel. Our primary method for reducing the loadings will be education---hazardous waste minimization training, coupled with follow-up technical assistance. Results of these efforts will be monitored with ongoing TWC systems as described in section "Description and Schedule of Activities to Monitor Success of the Implementation".

WHERE:

This project will affect the Houston Ship Channel system which is part of the San Jacinto River Basin and is located in Southeast Texas adjacent to the City of Houston and Galveston Bay.

WHEN:

September 1991 - Begin Study

December 1991 - Complete risk study delineating pollutants of concern in the Houston Ship Channel.

January 1992 - Complete delineation of businesses causing high risk pollutants in the Houston Ship Channel.

February 1992 - Begin contact businesses for program of industrial waste audits; waste recovery and exchange programs; and waste minimization training.

May 1992 - Begin training programs.

June 1993 - Begin follow-up and technical assistance as well as evaluation of program's success

January 1993 - Complete training programs.

HOW:

Delineation of Pollutants and risk analysis will be based on in house reports on the Galveston Bay and Houston Ship Channel, as well as any outside input that might be made available by Federal or local agencies.

Delineation of Businesses possibly causing the pollution will be based on matching the high risk pollutants to the Texas Water Commissions data on industrial businesses near the Houston Ship Channel. This includes the information on RCRA hazardous waste generators and SARA toxic materials emitters.

Contacts with the Businesses including training in industrial waste audits will be handled by the TWC's Waste Minimization Unit. These contacts will focus on incentives for businesses participating in the program. By having a waste minimization program a generator can:

* Save money by reducing waste treatment and disposal costs, raw material purchases, and other operating costs.
* Meet state and national waste minimization policy goals.
* Reduce potential environmental liabilities.
* Protect public health and worker health and safety.
* Protect the environment.

Methods for obtaining these benefits will be presented during the waste minimization training. Appendix A contains an outline of the proposed course.

Six months after the training course, a follow-up meeting will take place with each business participating in the program. The purpose of this meeting will be to offer further on-site technical assistance and to ascertain the business views on the success of the project. Quantitative measures of the success of the project will be measured employing the methods described in section 6 "Description and Schedule of Activities to Monitor Success of the Implementation".

## 6. DESCRIPTION AND SCHEDULE OF ACTIVITIES TO MONITOR SUCCESS OF THE IMPLEMENTATION.

Success will be measured with three existing systems:

a) In the State of Texas large quantity generators are required to file, annually, Hazardous Waste Minimization Reports. Historical reports filed by the businesses selected will be

reviewed and compared to reports filed by the companies after their training in waste minimization techniques.

b) Similar data on toxic materials is collected under SARA Section 313. This data will also be compared on a before and after basis.

c) Water quality discharge monitoring reports which include the quality and quantity of effluent discharged under the state NPDES system.

## 7. TIMETABLE AND DESCRIPTION OF REPORTS CONCERNING PROGRESS, COSTS, AND RESULTS.

Semi-annual reports will be prepared by the Texas Water Commission and submitted to the Technical Project Officer designated by the U.S. EPA.

## 8. DISCUSSION OF METHODS AND SCHEDULES FOR REVIEW, REEVALUATION, AND REDIRECTION OF THE PROJECT.

A workplan will be drafted based on this proposal which will be reviewed and approved by the Management Conference, EPA Region 6 and the GBNEP staff. Quarterly reports will provide opportunities for redirection. Any problems or changes in the scope of work will require discussion and resolution with GBNEP staff and EPA Region 6 staff at a minimum; and with appropriate GBNEP committees.

## 9. DISCUSSION OF POSSIBLE BASINWIDE AND/OR NATIONAL APPLICATION OF THE ACTION PLAN.

If successful, the techniques of delineating high risk pollutants, matching the pollutants to possible generators and working with the generators to conduct industrial waste audits and waste minimization training should be applicable throughout the basin and/or nationally.

Because the Texas Water Commission has district offices throughout the State it would be possible to work with each office and to apply the program's techniques to basins and businesses in their areas of the State. The data needed to develop the lists of high rise pollutants and businesses reside with the TWC in its Austin headquarters. In working with the local district staff, the waste minimization staff could develop the lists, contact the businesses and conduct waste minimization training on a basin-wide or statewide bases. The only constraints would be time and funding.

It is believed that similar data exists on a national basis; therefore, the techniques could be employed by other states.

**10. COMMITMENT TO DEVELOP COST ESTIMATES FOR BASINWIDE APPLICATION OF THE ACTION PLAN; THIS INFORMATION IS NECESSARY TO DEVISE FINANCIAL STRATEGIES FOR IMPLEMENTATION OF CCMP ACTION PLANS.**

If awarded the contract, the Texas Water Commission would commit to developing cost estimates for basinwide application of the action plan. These estimates can be used by GBNEP in development of a CCMP action plan.

**11. COST ESTIMATE**

A.) MANPOWER

| CATEGORY | ANNUAL SALARY (INC. RELEASE) | | UNIT | TOTAL COST |
|---|---|---|---|---|
| Program Admin.II | @ $37,950/year | x | 0.75 Year | $ 28,463 |
| Biologist | @ $37,950/year | x | 0.50 Year | $ 18,975 |
| Supervisor | @ $42,500/year | x | 0.10 Year | $ 4,250 |
| Secretary | @ $17,250/year | x | 0.10 Year | $ 1,725 |
| | | | | --- |
| Subtotal Salaries | | | | $ 53,413 |

B. BUDGET

| BUDGET CATEGORY | STATE SOURCE | FEDERAL SOURCE | TOTAL COST |
|---|---|---|---|
| I. Personnel | | | |
| A. Salaries | $13,354 | $40,059 | $ 53,413 |
| B. Fringe Bene. (@ 23.56%) | 3,146 | 9,438 | 12,584 |
| Subtotal | 16,500 | 49,497 | 65,997 |
| II. Nonpersonnel | | | |
| A. Travel | 1,395 | 4,187 | 5,582 |
| B. Equipment | 750 | 2,250 | 3,000 |
| C. Supplies | 750 | 2,250 | 3,000 |
| D. Contractual | 0 | 0 | 0 |
| E. Other | 0 | 0 | 0 |
| Total Direct Charges | 19,395 | 58,184 | 77,579 |
| III. Indirect Cost (@ 84.48%) | 13,938 | 41,816 | 55,754 |
| TOTAL | 33,333 | 100,000 | 133,333 |

C. WORKLOAD SCHEDULE

Work Objectives: (See "2. Statement of Specific Objectives Related to the Problem, Source, or Cause).

1. Define Pollutants - Based on analyses of risks, define the pollutants in the Houston Ship Channel.

2. Define Businesses - Based on a review of Texas Water Commission Hazardous Waste Generation data, define the businesses located near the channel most likely generating the pollutants found in the channel.

3. Select businesses - Select and contact 5 to 10 businesses and make arrangements for them to voluntarily participate in a program focusing on the use of waste audits, waste recovery methodologies, and waste exchange programs.

4. Conduct Training - Conduct waste minimization training for the selected businesses, either as a group or at individual sites. This objective will include preparation of teaching materials (handouts, overheads, etc) on which most of the supply and equipment budget will be spent. Also travel costs will be spent under this objective (ie. training trips to Houston).

| WORK OBJECTIVE | POSITION | TIME CHARGED (YEAR) | ANNUAL SALARY | TOTAL COST |
|---|---|---|---|---|
| DEFINE POLLUTANTS | BIOLOGIST | 0.20 | $37,950 | $ 7,590 |
| | PROGRAM ADMIN | 0.10 | $37,950 | $ 3,795 |
| DEFINE BUSINESSES | BIOLOGIST | 0.05 | $37,950 | $ 1,898 |
| | PROGRAM ADMIN | 0.05 | $37,950 | $ 1,898 |
| SELECT BUSINESSES | BIOLOGIST | 0.05 | $37,950 | $ 1,898 |
| | PROGRAM ADMIN | 0.05 | $37,950 | $ 1,898 |
| CONDUCT TRAINING | BIOLOGIST | 0.10 | $37,950 | $ 3,795 |
| | PROGRAM ADMIN | 0.45 | $37,950 | $17,076 |
| FOLLOW-UP | BIOLOGIST | 0.10 | $37,950 | $ 3,795 |
| | PROGRAM ADMIN | 0.10 | $37,950 | $ 3,795 |
| ADMIN. | PROJECT SUPER. | 0.10 | $42,500 | $ 4,250 |
| ADMIN. | PROJECT SECTY. | 0.10 | $17,250 | $ 1,725 |
| TOTAL SALARIES | | 1.25 | | $53,413 |

**HAZARDOUS WASTE MINIMIZATION**
**ONE DAY COURSE OUTLINE**

| | TIME |
|---|---|
| 1.0. Introduction | |
| 1.0. General - Greetings/Register/Materials/ Pass-outs and Class Outline (10 Minutes) | 8:30-8:40 |
| 1.1. Example of Hazardous Waste Minimization Project (10 minutes) | 8:40-8:50 |
| 1.2. Definitions (10 minutes) | 8:50-9:00 |
| 1.2.1. Waste Minimization | |
| 1.2.1.1. Source Reduction | |
| 1.2.1.2. Reuse/Recycling | |
| 1.2.2. Treatment | |
| 1.2.3. Examples of Waste Minimization Saving Money | |
| 1.2.4. Role of Waste Minimization In a Waste Management Program | |
| 1.3. Texas Hazardous Waste Management Hierarchy as It Relates to Waste Minimization (10 minutes) | 9:00-9:10 |
| 1.3.1. Minimization of Waste Production | |
| 1.3.2. Reuse and/or Recycling of Waste | |
| 1.3.3. Treatment to Destroy Hazardous Characteristics | |
| 1.3.4. Treatment to Reduce Hazardous Characteristics | |
| 1.3.4. Underground Injection | |
| 1.3.6. Land Disposal | |
| 1.4. Why Hazardous Waste Minimization? (20 Minutes) | |
| 1.4.1. Review Federal Law | |
| 1.4.1.1. Where We're At | |
| 1.4.1.2. Where We're Going | |
| 1.4.2. Review State Law | |
| 1.4.2.1. Where We're At | |
| 1.4.2.2. Where We're Going | |
| 1.4.3. Review Texas Hazardous Waste Statistics | |
| 1.4.3.1. Amounts Generated by Industry | |
| 1.4.3.2. Amount for Top 25; Top 200; LQG; SQG | |
| 1.4.3.3. Top 21 Texas Generators Names/Locations/Percent of Total | |
| 1.5. Video - Chevron - Smart Moves (30 Minutes) | 9:30-10:00 |

TIME

2.0. Introduction to Minimization Phases (10 Minutes) 10:00-10:10
- 2.1. General Course Outline
- 2.2. Modular Approach
  - 2.2.1. Planning and Organization
    - 2.2.1.1. Management Commitment
    - 2.2.1.2. Goals
    - 2.2.1.3. Program Organization
    - 2.2.1.4. Project Team Make-Up
  - 2.2.2. Assessment
    - 2.2.2.1. Site Description
    - 2.2.2.2. Personnel
    - 2.2.2.3. Process Information
    - 2.2.2.4. Input Materials Summary
    - 2.2.2.5. Products Summary
    - 2.2.2.6. Individual Waste Stream Characteristics
    - 2.2.2.7. Waste Stream Summary
    - 2.2.2.8. Option Generation
    - 2.2.2.9. Option Description
    - 2.2.2.10 Option Evaluation by Weighted Sum Method
  - 2.2.3. Feasibility Analysis
    - 2.2.3.1. Technical Feasibility
    - 2.2.3.2. Cost Information
    - 2.2.3.3. Profitability - Payback Period
    - 2.2.3.4. Profitability - NPV or IRR
  - 2.2.4. Implementation
    - 2.2.4.1. Project Summary
    - 2.2.4.2. Option Performance
    - 2.2.4.3. Presentation
  - 2.2.5. References
  - 2.2.6. Examples
  - 2.2.7. Case Studies

3.0. Break (15 minutes) 10:10-10:25

4.0. Planning and Organization (30 Minutes) 10:25-10:55
- 4.0.1. Where and How to Begin

- 4.1. Examples of Companies:
  - 4.1.1. Management Commitments
  - 4.1.2. Goals
    - 4.1.2.1. How to Build Goals
    - 4.1.2.2. Content/Key Elements and Objectives of a Waste Minimization Strategy
    - 4.1.2.3. Public or Private

4.2. Who Could be on a Project Team — TIME
- 4.2.1. LQG
- 4.2.2. SQG
- 4.2.3. Technical Leader and Corporate Leader
- 4.2.4. Enlist 3rd party experts
- 4.2.5. Involve R&D
- 4.2.6. Involve Engineering
- 4.2.7. Involve Manufacturing

4.3. How to Build Management Information Systems as a report card on progress towards goals

4.4. Train Employees

5.0. Goal Setting/Team Exercise — 10:55-11:30

6.0. LUNCH (60 minutes) — 11:30-12:30

7.0. Assessment I (70 minutes) — 12:30-1:40
- 7.1. Site Description
- 7.2. Personnel
- 7.3. Process Information
- 7.4. Input Materials Summary
- 7.5. Products Summary
- 7.6. Individual Waste Stream Characterization
- 7.7. Waste Stream Summary
- 7.8. Option Generation
  - 7.8.1. References
  - 7.8.2. TWC Tech. Library
  - 7.8.3. PPIC Tech. Database
  - 7.8.4. Lamar University
  - 7.8.5. Univ. Texas - Environmental Solutions Program
  - 7.8.6. List of Contractors
  - 7.8.7. TWC Handbooks
- 7.9. Option Evaluation By Weighted Sum Method

8.0. Assessment II (60 Minutes) — 1:40-2:40
- 8.1. Technical Feasibility
- 8.2. Cost Information
  - 8.2.1. Vendors
  - 8.2.2. Manuals
  - 8.2.3. Contractors
  - 8.2.4. Costing Textbooks

| | TIME |
|---|---|
| 8.3. Profitability | |
| 8.3.1. Payback Period | |
| 8.3.1.1. Introduce Concept and Formula | |
| 8.3.1.2. Work Example | |
| 8.3.1.3. References | |
| 8.3.2. NPV or IRR | |
| 8.3.2.1. Introduce concept and procedures | |
| 8.3.2.2. Work Example | |
| 8.3.2.3. References | |
| 8.4. Implementation | |
| 8.4.1. Project Summary | |
| 8.4.2. Option Performance | |
| 8.4.3. Presentation | |
| 8.4.4. Not Too Long | |
| 8.4.5. Repeat Introductory Case Study | |
| 9.0. VIDEO - 3M's Pollution Prevention Pays (9 minutes) - Challenge to Innovation (3M Corp.) (8.5 minutes) | 2:40-3:00 |
| 10.0. Recycling (30 minutes) | 3:00-3:30 |
| 10.1. Same procedures as those used for source reduction | |
| 10.2. RENEW Directory | |
| 10.3. Recyclers Directory | |
| 11.0. Treatment (10 minutes) | 3:30-3:40 |
| 12.0. Wrap-up (10 minutes) | 3:40-3:50 |